
Association of dietary intake and eating habit with the risk of pre diabetes in postmenopausal women

Hadeel Fadhil Farhood Ruaa Adil Abbas

FIBMS

MBChB

Abstract:

Background: Menopause is an inevitable and unavoidable event represented an important stage in women life. Poor quality and unhealthy diet, at this stage of life, may carry significant risk for different comorbidities like pre diabetes or type 2 diabetes.

Objectives: To assess the nutritional status, eating habit and dietary intake in postmenopausal women in Babylon and assess the distribution of pre diabetes in postmenopausal women and detect the association between nutritional health and prediabetes .

Material and Methods: Across-sectional study was conducted at two major hospital in Iraq, Babylon, from the 1st of March to the 30th of May 2015, included 105 postmenopausal women all were interviewed and their socio-demographic and personal data were collected. The nutritional health was assessed according to Nutritional Health scale. Food pyramid in postmenopausal women were assessed, anthropometric measurements were also taken and laboratory testing for hemoglobin A1C and fasting blood glucose were performed for all participant.

Results: According to the Nutritional Health Scale 15 (14.2%) post-menopausal women had good nutrition and 90 (85.8%) had poor nutrition. There were significant associations of Nutritional health by residence and occupational status, family history of DM, sleeping time and appetite, ($p \leq 0.05$), Majority of participant women had inadequate intake of whole grain, vegetables, fruit, milk and meat, (61.9%) of post-menopausal women were obese and (42.9%) of participants had pre-diabetes and there were significant associations of nutritional risk level by hemoglobin A1c and fasting blood glucose, p value ≤ 0.05 .

Conclusions: Majority of the Post-menopausal women had poor nutritional health scores, proportion of obesity among the studied group was higher than the national records and reported risk of pre-diabetes, with inadequate intake of food items.

Keyword: Prediabetes, postmenopause, dietary intake

Introduction:

Menopause is defined as permanent cessation of ovulation and marked by the end of menstruation for 1 year without menses⁽¹⁾. The life expectancy of about eighty years and most women are expected to spend one third to one half of their lives as postmenopausal women⁽²⁾. The menopausal symptoms might diminish the quality of life and interfere with daily activities such as work, social, leisure, sleep, mood, concentration, relationship, sexuality and enjoyment⁽³⁾. Prediabetes (PD) has been recognized as a state that occur when a person's blood glucose levels are increased more than normal but not high enough to diagnosed as diabetes. In pre-diabetics there is inability to metabolize insulin leading to impaired fasting glucose or impaired glucose tolerance⁽⁴⁾. Different studies investigated the relationship between menopause and the risk of Pre diabetes⁽⁵⁾. Some of these studies stated that Prediabetes directly associated with menopause, conversely, other studies reported no significant association⁽⁴⁾. In menopause women the occurrence of dysglycemia may be due to direct result of ovarian failure or an indirect result of metabolic consequences of central fat redistribution with deficiency of estrogen⁽⁶⁾. Some studies investigated between the eating habit and risk of Prediabetes in old women⁽⁷⁾. A nutritional assessment in the older population is important because in older persons, inadequate micronutrient intake is common, several age related medical conditions may predispose elderly persons to

vitamins and mineral deficiencies and mal absorption. There are 4 specific components to geriatric nutritional assessment: (1) nutritional history performed with a nutritional health checklist; (2) a record of a patient's usual food intake based on 24-hour dietary recall; (3) physical examination with particular attention to signs associated with inadequate nutrition or overconsumption; and (4) select laboratory tests, if applicable⁽⁸⁾. It's a simple screening tool for nutritional health assessment in postmenopausal women and used in our study is the Nutritional Health Checklist for older persons for assessing the vulnerability status of each of the respondents⁽⁹⁾. The checklist was modified to suit the food intake, economic, health, family life and functional capacity⁽⁸⁾.

Objectives:

Assessment of the nutritional status, eating habit and dietary intake in postmenopausal women in Babylon and its relation with risk of pre diabetes in postmenopausal women.

Material and Method:

Ethical issues:

The objectives and methodology of this study were explained to all participant in the study to gain their verbal acceptance, approval of scientific committee of the community medicine department in Babylon medical college (University of Babylon, Iraq), approval of Babylon medical college ethical committee,

consent and permission was taken from Babylon health directorate under Ministry of Health and information Center for Research and Development of Babylon province.

study design and data collection time: This was a cross-sectional study conducted at Babylon Teaching Hospital for Gynecology and Pediatrics and Marjan Medical City in Babylon province, during the period from the 1st of march to the 30th of May 2015. A total of 105 postmenopausal women were included in this study. (Postmenopausal women which had permanent cessation of ovulation, marked by the end of menstruation for 1 year without menses)⁽¹⁰⁾, were inclusion in the current study.

Data collection tools:

Questionnaires

(A) The socio-demographic characteristics .

(B) **Nutritional Health check list:** This check list was adopted from the original Mini-Nutritional Assessment (MNA) a screening tool for nutritional status for elderly⁽⁹⁾.

Nutritional assessment:

Anthropometric measurements: Weight, height, (BMI=weight/height²) and waist circumference⁽¹¹⁾

Biochemical investigation: Under aseptic conditions and venipuncture, a sample of venous blood was taken from each participant. The taken sample sent to the lab for measurement of HbA1c

and FBG levels. **Measurement of HbA1c level:** Stanbio™ Glycohemoglobin Pre-Fil™ Test Kit was used for measurement of HbA1c level of the participants, each kit was designed for 50 tests.

Statistical analysis:

Data of patients and participant were transformed and entered to the computer by using database software with statistical utilities; recording information was performed using statistical package for social science software (SSPS) version 17.

standard deviation (SD) and proportions, also Chi-squared test was used for the assessment of variable studied. Level of significance (P-value) was set at ≤ 0.05.

RESULTS: The distribution of Post-Menopausal Women by Age, Height, Weight, BMI, FBS and HbA1c. The overall mean age was (54.58±7.20) years old. The overall mean weight and height were (76.09±12.76) kg and (1.56±0.05) m², BMI was (31.21±4.94) kg/m². The overall mean FBS and HbA1c were (106.43±11.98) mg/dL and (5.64±0.60)%, respectively. The mean age at menopause and was (47.74±2.64) years. Meanwhile, the mean Nutritional Health Scale was (5.15± 2.59). Figure(1) only (14.2%) of the women had good nutrition by nutritional health. Table(1) There were significant associations of Nutritional Risk Level by residence and occupational status, p value ≤ 0.05 is significant.

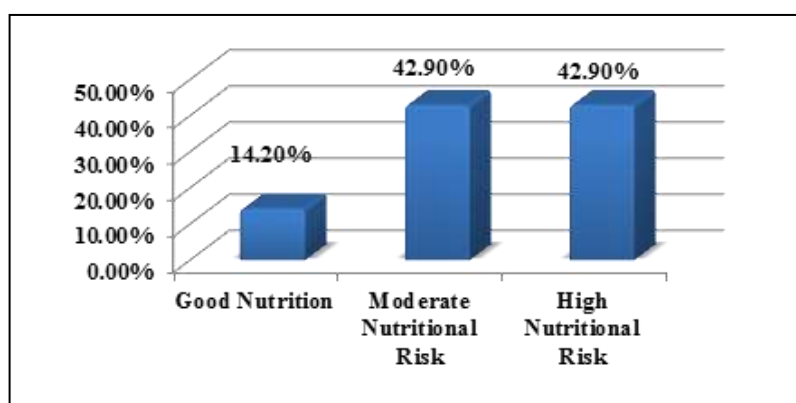


Figure 1. Distribution of Post-Menopausal women by Nutritional Health

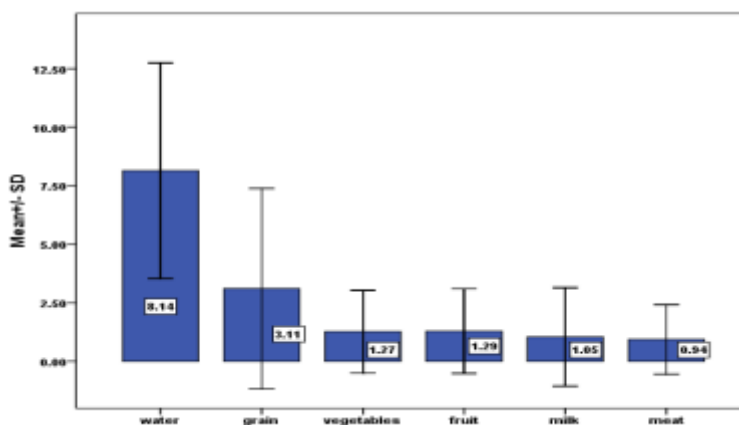
Table1. Association of Nutritional Risk Level by Socio-Demographic Characteristics

Variable	Nutritional Risk Level		Total(%)	χ^2	df	P value
	Good(%)	Poor(%)				
Age group						
<55 years	7 (46.7)	60 (66.7)	67 (63.8)	2.227	1	0.136
≥ 55 years	8 (53.3)	30 (33.3)	38 (36.2)			
Educational status						
Illiterate	7 (46.7)	51 (56.7)	58 (55.2)	1.014	2	0.602
Read and write	8 (53.3)	37 (41.1)	45 (42.9)			
Primary school and above	0 (0.0)	2 (2.2)	2 (1.9)			
Occupational status						
Housewife	15 (100.0)	70 (77.8)	85 (77.8)	4.118	1	0.042*
Employed	0 (0.0)	20 (22.2)	20 (22.2)			
Residence						
Urban area	2 (13.3)	49 (54.4)	51 (48.6)	8.699	1	0.003*
Rural area	13 (86.7)	41 (45.6)	54 (51.4)			
Marital status						
Married	10 (66.7)	67 (74.4)	77 (73.3)	0.398	1	0.528
Unmarried	5 (33.3)	23 (25.6)	28 (26.7)			

*p value ≤ 0.05 is significant

Figure (2) shows the overall mean of food serving, the overall mean of water, grain, vegetables, fruit, milk and meat were (8.14±2.30), (3.11±2.13), (1.27±0.88), (1.29±0.90), (1.05±1.05) and (0.94±0.74), respectively. The range of water, grain, vegetables, fruit, milk and meat was (8-26), (0-24), (0-8), (0-8), (0-6) and (0-6), respectively. Table(2) shows the mean differences

of food serving by Nutritional Risk Level, there were no significant mean differences of food serving by Nutritional Risk Level. Distribution of post-menopausal women by BMI (61.9%) were obese, (21.0) were overweight, (13.3) were normal weight and (3.80) were lean weight of postmenopausal women.



Figure(2): Distribution of Post-Menopausal Women by Food Serving

Table(2):Mean differences of food serving by Nutritional Health

Serving	NHS	N	Mean	S.D	t-test	P value
Water	Good nutrition	15	7.93	2.76	0.379	0.705
	Poor nutrition	90	8.17	2.23		
Grain	Good nutrition	15	2.53	1.79	1.141	0.256
	Poor nutrition	90	3.21	2.17		
Vegetable	Good nutrition	15	1.20	0.86	0.337	0.737
	Poor nutrition	90	1.28	0.89		
Fruit	Good nutrition	15	1.53	0.99	1.126	0.263
	Poor nutrition	90	1.25	0.88		
Milk	Good nutrition	15	0.80	1.14	0.986	0.326
	Poor nutrition	90	1.08	1.03		
Meat	Good nutrition	15	0.80	0.86	0.805	0.423
	Poor nutrition	90	0.96	0.72		

Figure (3) shows the distribution of DM Patients by Hemoglobin A1c Classes. (42.9%) of DM patients were in pre-DM class. Table (3) There were significant associations of Nutritional Risk Level by Hemoglobin A1c and Fasting Blood Sugar, p value ≤ 0.05 is significant. The current

study also reported positive correlation of Hemoglobin A1c and BMI for DM patients. There was direct moderate significant correlation of Hemoglobin A1c and BMI for DM patients. $p < 0.001$ and also between HbA1c and WC for D.M patients.

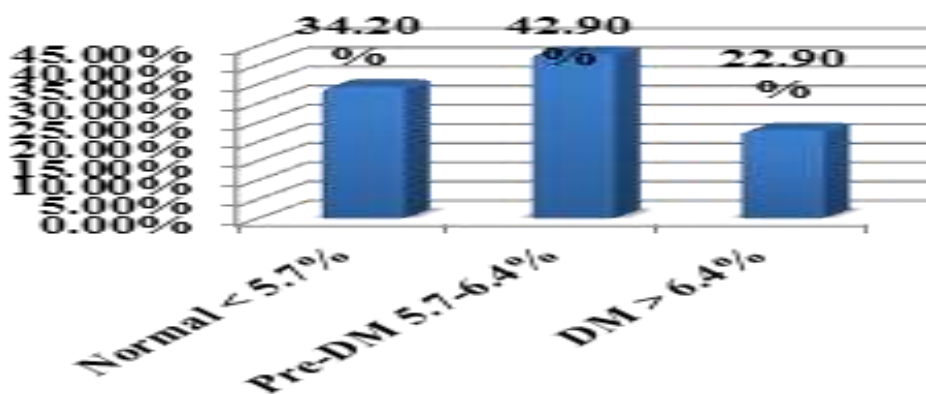


Figure 3. Distribution of postmenopausal by Hemoglobin A1c Classes

Table 3. Association of Nutritional Risk Level by Hemoglobin A1c and Fasting Blood Sugar

Variable	Nutritional Risk Level		Total (%)	χ^2	df	P value
	Good(%)	Poor(%)				
Hemoglobin A1c						
Normal < 5.7%	10 (66.7)	26 (28.9)	36 (34.3)	8.429	2	0.015*
Pre-DM 5.7-6.4%	4 (26.7)	41 (45.6)	45 (42.9)			
DM > 6.4%	1 (6.6)	23 (25.6)	24 (22.9)			
Fasting Blood Sugar						
Normal < 100 mg/dl	10 (66.7)	30 (33.3)	40 (38.1)	6.109	2	0.047*
Pre-DM 100-126 mg/dl	4 (26.6)	51 (56.7)	55 (52.4)			
DM > 126 mg/dl	1 (6.7)	9 (10.0)	10 (9.5)			

*p value ≤ 0.05 is significant, ^{ac} Fisher Exact Test

Discussion: Postmenopausal status and hyperglycemia are widely investigated, however, findings about whether the postmenopausal state would influence hyperglycemia in dependently of normal aging remain controversial. Previous studies reported that menopause was associated with the presence of dysglycemia and pre-diabetes status in addition to poor quality of diet and nutritional health.^(12,13)

Assessment of nutritional health of postmenopausal women:

Current study assessed the nutritional health of postmenopausal women according to numbers of food serving, that found (14.2%) of the women had good nutritional health, and (85.8%) reported moderate and high nutritional risk. These findings consistent with De Almeida Ventura D et al. in 2014⁽¹⁴⁾ that reported only (0.9%) of the Brazilian postmenopausal women had good dietary health. housewives were more likely to have good nutritional health than employed, this significant association might be related to the lower number of employed women as majority of the studied group was housewives, additionally the employed women might have inadequate time to get healthy diet or eating recommended meals and sometimes one or more meals might skipped particularly the breakfast meal, additionally some of the employed women consumed fast or canned food. Regarding the residence, women who were residents in rural areas were more likely to have good nutritional health than those in urban area; and the significant association between the rural residence and the good nutritional health might be related to the lifestyle in these areas, as it is well known that urbanization is associated with unhealthy fast food intake and less quality of food and agricultural environment were more likely to consume fresh vegetables and fruits in addition to calcium and vitamins rich diet that present in their food items such as dairy products.

Distribution of postmenopausal women by food serving:

The current study found that overall mean of food serving of the main food groups and water categories including grain, vegetables, fruit, milk and meat and water were not significantly different between the good nutritional health and poor nutritional health postmenopausal women. The insignificant differences between the two study subgroups might attributed to different factors; firstly the nutritional health of the studied group affected by the demographic characteristics of the postmenopausal women, secondly total calorie requirement had been documented to be reduced with advancing age; analysis of servings of food items in categories was not performed in our study. Hung et al⁽¹⁵⁾ assessed the association between cardiovascular diseases and fruit intake, when intake was of ≥ 3 fruit servings per day it considered to be productive. The current study found that, only (3.8%) were lean, (13.3%) normal weight, (21.0%) overweight and (61.9%) of the postmenopausal were obese according to BMI. The proportion of obesity reported among the studied group was higher than that reported in the risk factors of National Chronic Non-Communicable Diseases survey in Iraq in 2006⁽¹⁶⁾, where 47% of the surveyed women aged > 45 years were obese.⁽¹⁷⁻¹⁸⁾ Also this proportion of risky WC was lower than that reported in Saudi Arabia⁽¹⁹⁾ where the mean WC of women aged (40-60) years was (90.7 ± 13.5) cm and the overall prevalence of abdominal obesity (WC ≥ 88cm) was (41.1%). On the other hand, findings of the present study regarding the WC were consistent with that reported in Brazilian study⁽²⁰⁾ that found among 456 postmenopausal women aged (45 – 69) years a mean WC of (99.8 ± 9.9) cm, and 63.6% had abdominal obesity; risky WC (≥ 88 cm) and the risk increased with the advancing age⁽¹⁸⁾.

Pre-diabetes among the studied group:

In the current study pre-diabetes was diagnosed according to the American diabetes association (ADA) criteria that recommended cutoff points of (5.7 – 6.4 %) to be considered as PD, from other point of view glycated hemoglobin testing was recently used as screening tool for PD where the American diabetes association recently its screening recommendation for pre diabetes to include glycated hemoglobin as non-fasting diagnostic testing option.⁽²¹⁻²²⁾ The proportion, (42.9%) of pre-diabetes with HbA1c(5.64±0.60) reported in the current study was higher than that reported among U.S. adults Mann et al⁽²²⁾ reported in 2010 a prevalence of 12.6% pre-diabetes among the US adults according to glycated hemoglobin criteria of American diabetes association while the prevalence was 28.2% by the fasting glucose criterion⁽²¹⁾ Getting diagnose by pre diabetes is a serious wake-up call and it doesn't have to mean it will definitely have diabetes. There is time to turn things around, hence, for all pre-diabetes patients, life style modifications, emphasizing modest weight loss and moderate physical activity are strongly recommended, healthy diet and diet modification in postmenopausal women in addition to the dietary screening and monitoring⁽²³⁾.

References

- 1-Goodman N.F., Cobin R.H., Medical Guidelines for Clinical Practice for the diagnosis and treatment of menopause. 2011; 17 (sup 6):22-27.
- 2-Najmabadi K. Exercise prescription for Iranian midlife women. *Int J Gen Med.* 2010; 3: 365–369.
- 3-Woods NF. Menopause, symptoms, and quality of life: time for a theoretical framework. *Menopause.* 2010 Sep-Oct;17(5):892-3.
- 4-Heianza Y, Arase Y, Kodama S, et al. Effect of Postmenopausal Status and Age at Menopause on Type 2 Diabetes and Prediabetes in Japanese Individuals . 2013;36(12):4007-4014.
- 5-Tuomilehto J, Lindström J, Eriksson JG, Valle TT, Hämäläinen H, Ilanne-Parikka P, et al . Prevention of type 2 diabetes mellitus. *N Engl J Med.* 2001 May 3;344(18):1343-50
- 6-Carr MC The emergence of the metabolic syndrome with menopause .*J ClinEndocrinolMetab.* 2003 Jun; 88(6):2404-11.
- 7-Knowler W, Barrett-Conner Eowler S. The diabetes prevention program. *N Engl J Med,* 2002; 346: 393–403.
- 8-Olasumbo O, Ayo D. Health Seeking Behaviour, Food Habit and Nutritional Assessment of an Elderly Group in Ile Ife, Nigeria. *J community Med Heal Educ.* 2013;3(5):224

- 9-Elsawy B, Higgins KE, The geriatric assessment. *Am Fam Physician,* 2011; 83(1), 48-56.
- 10-Burger,H.,G,MD.(2007).Androgen production in women.*Fertility and sterility,*77(supp14),3-5.
- 11-World Health Organization (WHO). (1997). Obesity-preventing and managing the global epidemic. Geneve, 17-7.
- 12-Wu SI, Chou P, Tsai ST.The impact of years since menopause on the development of impaired glucose tolerance.*J ClinEpidemiol.* 2001;54(2):117-120.
- 13-Lin W-Y, Yang W-S, Lee L-T, et al. Insulin resistance, obesity, and metabolic syndromemenopausal in North Taiwan. *Int J Obes (Lond).* 2006;30(6):912-917.
- 14-De Almeida Ventura D, de Matos Fonseca V, Ramos E, et al. Association between quality of the diet and CVD in postmenopausal. *Nutr J.* 2014;13(1):121.
- 15-Hung H-C, Jiang R, et al. Fruit and vegetable intake and risk of major chronic disease. *J Natl Cancer Inst.* 2004;96(21):1577-1584. doi:10.1093/jnci/djh296.
- 16-Gerstein HC, Yusuf S, Bosch J, et al. Effect of rosiglitazone on the frequency of diabetes in patients with impaired glucose tolerance or impaired fasting glucose: a randomized controlled trial. *Lancet.* 2006;368(9541):1096-1105.
- 17-Chiasson J, Josse RG, Gomis R, Laakso M. Acarbose for prevention of type 2 diabetes mellitus.*Lancet.* 2002;359(9323):7-8.
- 18- Rhee MK, Herrick K, Ziemer DC, et al. Many Americans have pre-diabetes and should be considered for metformin therapy. *Diabetes Care.* 2010;33(1):49-54.
- 19-Khalid ME.The prevalence of abdominal obesity and its associated risk factors in married, southwestern, Saudi Arabia. *Saudi Med J.* 2007;28(12):1875-1880.
- 20-Akahoshi M, Soda M, Nakashima E, et al. The effects of body mass index on age at menopause. *Int J ObesRelatMetab Disord.* 2002;26(7):961-8.
- 21-Mann DM, Carson AP, Shimbo D, Fox CS, Muntner P. Impact of A1C screening criterion on the diagnosis of pre-diabetes among U.S. 2010;33(10):2190-2195.
- 22- Association AD (ADA). Standards of medical care in diabetes. 2010;33(S):11-61.
- 23-Abujbara M a., Ajlouni KM. Approach to dysglycemia.*Int J Diabetes Mellit.* 2009;1(1):22-25. doi:10.1016/j.ijdm.2009.03.011.